REMARKS/ARGUMENTS

Claims 4 and 6 are pending in this application. By this Amendment, Applicant amends Claims 4 and 6 and cancels Claim 5.

Claims 4-6 were rejected under 35 U.S.C. § 102(b) as being anticipated by Gopalan et al. (U.S. 6,211,999). Claim 5 has been canceled Applicant respectfully traverses the rejection of Claims 4 and 6.

Claim 4 has been amended to recite:

> **A lens** comprising:
> lithium tantalate including a lithium oxide and a tantalum oxide;
> wherein
> **a molar composition ratio of the lithium oxide and the tantalum oxide (Li_2O/Ta_2O_5) in the lithium tantalate is in a range of 0.975 to 0.982**; and
> **a birefringence of the lithium tantalate is in a range of -0.0005 to 0.0005**.

With the unique combination and arrangement of features recited in Applicant's Claim 4, Applicant has been able to provide a lens using lithium tantalate. As described in paragraphs [0006] to [0008] of Applicant's originally filed Substitute Specification, lithium tantalate is well-known as a material for optical elements, such as a wavelength conversion elements, an optical diffraction element, and a phase conjugate mirror. However, since the birefringence of lithium tantalate is substantially 0.006, when light comes from various directions, images are duplicated. Accordingly, lithium tantalate has not previously been used for lenses.

However, the inventors of the present invention discovered that the birefringence is greatly reduced in lithium tantalate having the composition recited in Applicant's Claim 4, and lithium tantalate with the particular claimed composition was preferable as a lens.

Specifically, the lens as recited in Applicant's Claim 4 is comprised of lithium tantalate having a molar composition ratio of lithium oxide and tantalum oxide (Li_2O/Ta_2O_5) in a range of 0.975 to 0.982. With this molar composition ratio, the birefringence can be confined within a range of ±0.0005.

In this manner, miniaturized and thinned lenses utilizing the high refractive index (more than 2.0) of the lithium tantalate can be provided (see, for example, paragraphs [0006], [0054], [0055] of Applicant's originally filed Substitute Specification and Figs. 4 and 5 of Applicant's originally filed specification).

The lens recited Applicant's Claim 4 is capable of obtaining an increased NA as compared to the existing lenses, such as glass lenses, and thus the brightness is increased (see, for example, paragraph [0058] and Table 1 of Applicant's originally filed Substitute Specification).

As a result of this, the effective aperture of the lens recited in Applicant's Claim 4 can be reduced as compared to existing lenses. Thereby, if the lens recited in Applicant's Claim 4 is used in an optical electronic device, such as an endoscope, a magneto optical disk, and a digital camera, it will be extremely advantageous to the miniaturization of the optical electronic devices.

As shown by relationship between molar composition ratio and refractive index in Fig. 2 of Applicant's originally filed drawings, the range of ±0.0005 of the birefringence can be achieved in lithium tantalate with the molar composition ratio deviated from so-called stoichiometric composition ((Li_2O/Ta_2O_5) =1.00).

The range of ±0.0005 of the birefringence can be achieved in a range of molar composition ratios slightly shifted from a stoichiometric composition toward a Li deficient side.

As the Examiner noted, Gopalan et al. discloses a lithium tantalate single crystal having a molar fraction of $(Li_2O/(Li_2O+Ta_2O_5))$ between 0.492 and 0.50. Gopalan et al. further discloses that the lithium tantalate single crystal having the molar fraction disclosed therein requires a voltage of not greater than 10 kV/mm for its polarization inversion.

Specifically, Gopalan et al. is directed to an optical element using a superior electro-optical constant and a non-linear optical constant of a lithium tantalate single crystal, and particularly to a quasi-phase matching (QPM) element using the polarization inversion structure.

Gopalan et al. is directed to providing a lithium tantalate single crystal which facilitates the production of the polarization inversion structure, in view of the fact that it is difficult to produce a polarization inversion structure having a short period and high accuracy and an optical element having a thick polarization inversion structure because the conventional lithium tantalate single crystal with a congruent composition requires a voltage of not less than 20 kV/mm for its polarization inversion (see, for example, col. 1, line 59 to col. 2, line 5 and col. 3, lines 39 to 47 of Gopalan et al.).

Gopalan et al. discloses that the polarization inversion voltage of the lithium tantalate single crystal having a molar fraction of $(Li_2O/(Li_2O+Ta_2O_5))$ between 0.492 and 0.50 was reduced to less than half of the polarization inversion voltage of the congruent composition lithium tantalate single crystal, and the polarization inversion voltage of the lithium tantalate having a molar fraction of 0.50 (stoichiometric composition) was reduced to 1.4 kV/mm.

Therefore, the lithium tantalate single crystal taught by Gopalan et al. is effective for second harmonics generation (SHG) elements having a short period and highly precise polarization inversion structure or for an optical element having a thick polarization inversion structure.

The Examiner alleged that Gopalan et al. teaches all of the features recited in Applicant's Claim 4.

Applicant's Claim 4 has been amended to recite "[a] lens" instead of "[a] lens material". Support for this feature is found, for example, in Examples 1 and 2 of Applicant's originally filed Substitute Specification.

As described above, Gopalan et al. discloses that the lithium tantalate single crystal is used for optical elements, such as QPM elements and memory elements. However, Gopalan et al. fails to teach or suggest that the lithium tantalate single crystal disclosed therein could or should be used for a lens as recited in Applicant's Claim 4. That is, Gopalan et al. is silent with respect to lithium tantalate being used for a lens, which does not require a polarization inversion structure and which does not utilizes the electro-optical constant and the nonlinear optical constant.

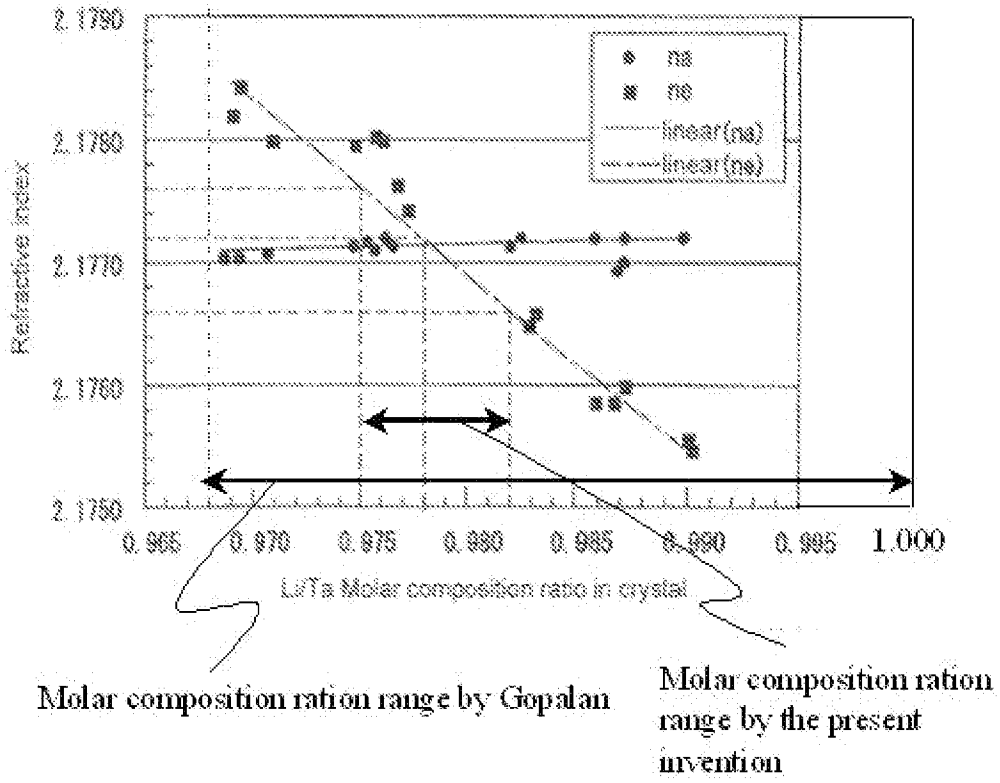
In addition, as noted above, lithium tantalate is a well-known material that is used for optical elements due to its superior electro-optical constant and non-linear optical constant. However, lithium tantalate is also well-known to those skilled in the art to be an unsuitable material for a lens due to its high birefringence.

Gopalan et al. teaches a lithium tantalate single crystal having a molar fraction of $(Li_2O/(Li_2O+Ta_2O_5))$ between 0.492 and 0.50 (equivalent to a molar composition ratio of (Li_2O/Ta_2O_5) between 0.968 and 1.00).

However, Gopalan et al. does not teach, suggest, or even recognize that only lithium tantalate having a molar composition ratio of (Li_2O/Ta_2O_5) between 0.975 and 0.982 as recited in Applicant's Claim 4 (among the molar composition ratio of (Li_2O/Ta_2O_5) between 0.968 and 1.00 disclosed in Gopalan et al.) has a birefringence within ±0.0005.

Although Gopalan et al. teaches a lithium tantalate single crystal with the molar composition ratio that includes a molar composition ratio that falls within the range recited in Applicant's Claim 4, Gopalan et al. fails to teach, suggest, or even recognize an relationship whatsoever between the molar composition ratio and the birefringence of lithium tantalate. As shown in the following figure (which substantially corresponds to Fig. 2 of Applicant's originally filed drawings), it is clear that the lithium tantalate single crystal of Gopalan et al. includes molar composition ratio values which are not suitable for use in a lens due to the large amount of birefringence.

Based on the fact that Gopalan et al. is directed only to changing the polarization inversion voltage and those skilled in the art consider lithium tantalate to be unsuitable for a lens due to the large amount of the birefringence, Gopalan et al. certainly cannot be fairly construed as teaching or suggesting that the birefringence can be controlled in the range of ±0.0005 by modifying from the molar composition ratio between 0.968 and 1.000 as taught Gopalan et al. to the extremely narrow molar composition ratio between 0.975 to 0.982 as recited in Applicant's Claim 4.



Thus, contrary to the Examiner's allegations, the lithium tantalate single crystal having a molar fraction of ($Li_2O/(Li_2O+Ta_2O_5)$) between 0.492 and 0.50, which is equivalent to a molar composition ratio of (Li_2O/Ta_2O_5) between 0.968 and 1.00 does not inherently have a birefringence within ±0.0005, because the molar composition ratios between 0.968 and 0.974 and between 0.983 and 1.00 do not have a birefringence within ±0.0005.

The Examiner is reminded that inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981). *See also Ex parte Skinner*, 2 USPQ2d 1788, 1789 (BPAI 1986) ("[T]he examiner must provide some evidence or scientific reasoning to establish the reasonableness of the examiner's belief that the functional limitation is an inherent characteristic of the prior art" before the burden is shifted to the applicant to disprove the inherency.).

Therefore, contrary to the Examiner's allegations, Gopalan et al. fails to teach or suggest "[a] lens" that includes the features of "a molar composition ratio of the lithium oxide and the tantalum oxide (Li_2O/Ta_2O_5) in the lithium tantalate is in a range of 0.975 to 0.982" and "a birefringence of the lithium tantalate is in a range of -0.0005 to 0.0005" as recited in Applicant's Claim 4.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of Claim 4 under 35 U.S.C. § 102(b) as being anticipated by Gopalan et al.

In view of the foregoing amendments and remarks, Applicant respectfully submits that Claim 4 is allowable. Claim 6 depends upon Claim 4, and is therefore allowable for at least the reasons that Claim 4 is allowable.

In view of the foregoing amendments and remarks, Applicant respectfully submits that this application is in condition for allowance. Favorable consideration and prompt allowance are solicited.

To the extent necessary, Applicant petitions the Commissioner for a One-Month Extension of Time, extending to October 29, 2009, the period for response to the Office Action dated June 29, 2009.

The Commissioner is authorized to charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1353.

Respectfully submitted,

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/Christopher A. Bennett #46,710/
Attorneys for Applicant

KEATING & BENNETT, LLP
1800 Alexander Bell Drive, Suite 200
Reston, VA 20191
Telephone: (571) 313-7440
Facsimile: (571) 313-7421

Joseph R. Keating
Registration No. 37,368

Christopher A. Bennett
Registration No. 46,710